

Management of Seedbeds with Trickle Irrigation

With new trickle irrigation in plant beds, you can get larger, taller better-distributed seedlings with good root systems. The system, set on 24-hour controls to water 30 minutes twice daily, saves on water, electricity, fertilizer, insecticide and labor. Researchers working on the project think trickle irrigation will someday lead to smaller plant beds because more plants will survive and thrive.

For rapid and vigorous growth, tobacco seedlings in a dense stand in seedbeds under perforated plastic covers must be irrigated and fertilized.

Perforations permit water loss from the bed but restrict the amount of rain that infiltrates the soil. These seedbeds can not be

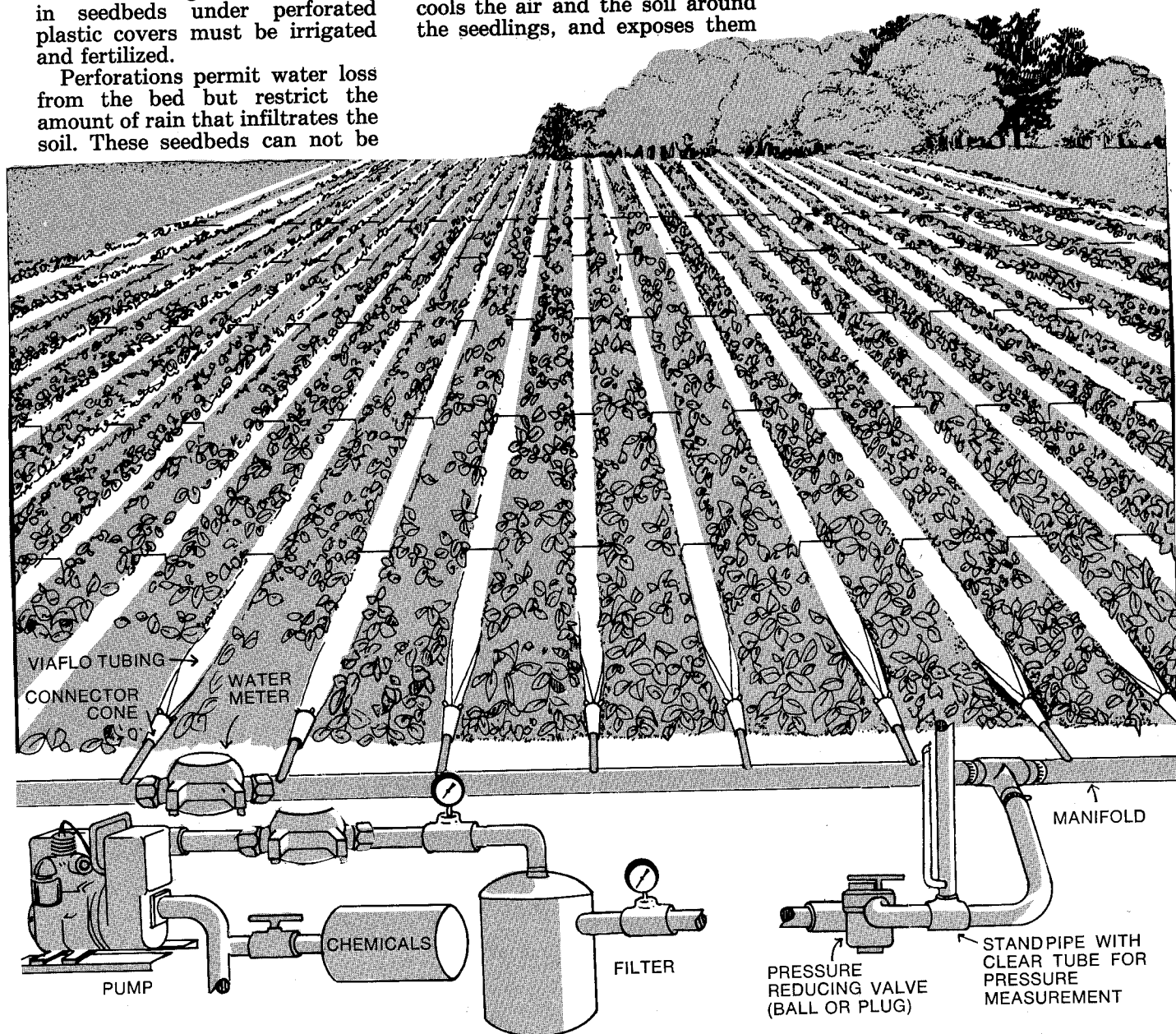
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irrigated with sprinkler systems without removing the plastic covers. This requires extra labor, cools the air and the soil around the seedlings, and exposes them

to weed, insect and disease infestations. On windy days, removal of plastic covers may not be possible.

In December 1974, beds 295 x 13 feet were plowed, leveled, fumigated with methyl bromide at a depth of 4 to 6 inches, and covered with a solid polyethylene plastic film 3 mil thick. A furrow 20 inches deep was cut between each bed to provide drainage, the surface of the bed was leveled, and the excess soil was used to keep the edges of the plastic cover in place. Before planting the tobacco, the covers were perforated and folded along the side of each bed.

Fertilizer (6-10-4) was broadcast at the rate of 193 lbs/acre and



Schematic of typical Viaflo trickle irrigation system.

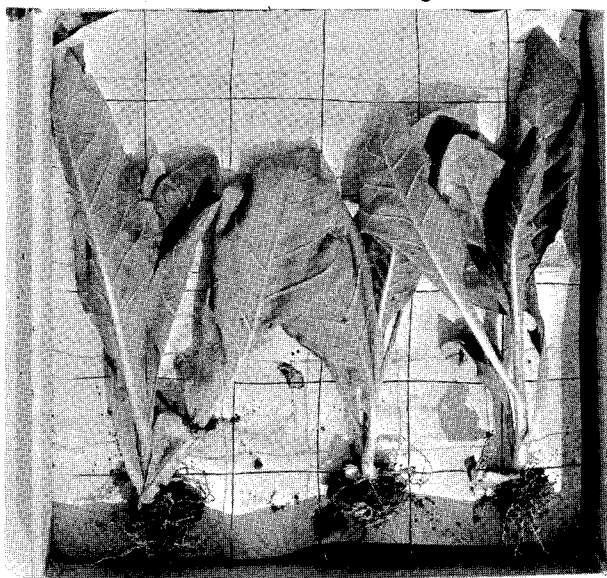
Management of

disk-plowed into the soil. The beds were packed slightly with a roller to provide 10 feet of bed width.

Six Viaflo porous plastic tubes were installed simultaneously at either the 2- or 6-in. depth in each bed, using a tool bar, fitted with six trail sweeps mounted 20 inches apart. Six tube-feed guides were attached to the rear of each trail sweep. A drag harrow was pulled behind the tool bar to cover the tubes and level the plots. Installed tubes were connected by plastic connector cones, O-ring, and feeder tubes to holes, 21/64 in. in diameter, drilled directly into a 3/4-in. PVC manifold buried at the head of each bed. The other end of each Viaflo line was closed by folding back the tubing and inserting it into another plastic connector cone.

The water pressure at the bed manifold was regulated at 3 psi by a pressure regulator and a 0-15 psi pressure gauge. The solenoid valve, pressure regulator and pressure gauge were housed in a plastic water meter box buried in the soil. A 60-watt light bulb was installed in each box to prevent frost damage to the equipment. Water for the irrigation system was pumped from a shallow well by a 1-1/2 hp electric pump.

Sprinkler-irrigated tobacco seedlings.



Simultaneous installation of six Viaflo porous tubes at 8/10 inch depth and 20 inches apart using a tool bar and a feed tube-sweep combination.



Water and chemicals were filtered through a 5-micron cartridge filter system and then distributed to the beds by a manifold and solenoid valves activated by the irrigation system controller. The filter system was backflushed when the difference in gauge pressure across the filter was greater than 15 psig. Fertilizer solution (10-20-10) and pesticides (disulfoton and oxamyl) were metered through the porous tube system with a metering pump without removing the plastic covers.

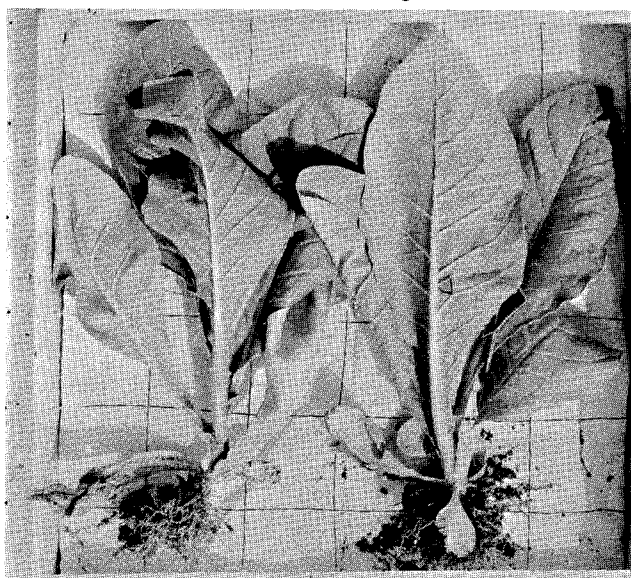
Plant Beds Seeded

After the Viaflo porous plastic tube trickle irrigation system was

installed, tobacco plant beds were seeded by mixing the seeds with a sand medium, broadcasting the mixture over the whole bed, covering and packing the soil slightly with a roller, and wetting the beds with a fine spray of water. Three rows of semicircular wire hoops with pairs of hoops driven into the soil perpendicular to each other were used to support the plastic cover about 20 cm above the soil surface. The cover was put over the bed and held in place by burying its edges under the excess soil removed from the drainage ditch.

The porous plastic tube trickle irrigation system was controlled automatically by an irrigation controller consisting of electrical tensiometers installed in series

Trickle-irrigated tobacco seedlings.



with a 24-hour clock. The clock was set to irrigate for 30 minutes twice daily, if the control tensiometer measurement was above the preset level. Irrigation was automatically bypassed if the tensiometer measurement was below the preset level. Control tensiometers were installed 6 inches deep and 5 inches from the tube.

For comparison, three full-circle sprinklers, spaced 50 ft. apart, were used to irrigate two plots with 1/2 inch of irrigation water based on the tensiometer measurements. Sprinkler-irrigated beds could not be automated because the plastic covers had to be removed before each irrigation. Fertilizers and pesticides were broadcast on the beds as necessary.

A random sample of 10 plants each at sites 50, 100, 150, and 200 feet from the head of the plots was pulled prior to transplanting. Seedling height, fresh weight, dry weight, leaf area, and number of leaves were measured.

In 1976 a simpler approach was used to minimize costs. A 3-hp gasoline engine and a centrifugal shallow well pump were used to pump water from a shallow 2-inch-diameter well. A "T" connection on the suction side of the pump was used to inject fertilizers and chemicals through the Viaflo tubes. The water was filtered with a cartridge filter system similar to the one used in the previous test. The water distribution system and manifold consisted of 2-inch layflat plastic hose to which the Viaflo porous tube was connected. The Viaflo tubes were placed on top of the soil and held in place with wire wickets. Water flow and pressure to the tubes were adjusted and controlled by screw-regulated valves and measured occasionally by a pressure gauge inserted through a rubber septum.

Trickle-irrigated seedlings were usually larger, taller and better distributed than sprinkler-irrigated seedlings.

No Difference

Soil water regimes did not differ for the various treatments. Because of the different amount of water applied at each irrigation with the sprinkler- and trickle-irrigation system, the soil water content fluctuated slightly more in the sprinkler-irrigated plots than in the trickler-irrigated plots.

Installation of the Viaflo porous tubes on the soil surface (1976) and at 2- and 6-in. depths (1975) did not affect the growth, density and yield of seedlings. But because porous tubes installed on the surface are more vulnerable to damage during transplanting operations, we recommend that they be installed at the 2-in. depth.

With the trickle irrigation management system, water, electricity, fertilizer and insecticide were used more effectively, and an estimated 30 man-hours of labor were saved per hectare per irrigation. In the future, application of this system can lead to use of smaller seedbeds, and similar systems can be used to grow various type of seedlings and for intensive production of early vegetable crops.

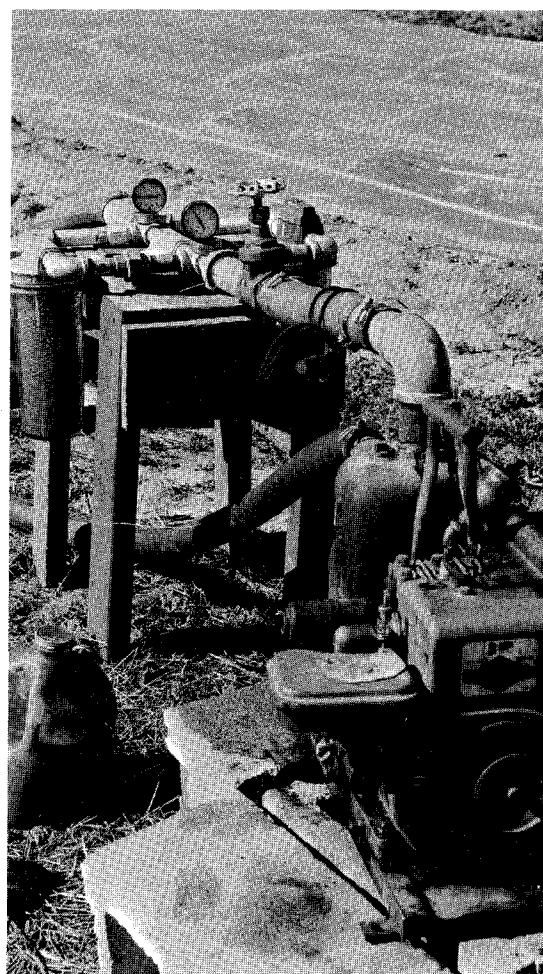
C.R. Cribb, on whose land the plots were installed, indicated that he was able to supply seedlings for his own operation and for five additional growers. He said installation of the Viaflo at the 2-inch depth provided seedlings with a more substantial root system that were better suited for transplanting. Trickle-irrigated seedlings had a 100 percent recovery after transplanting.

The initial material cost per hectare (well not included) (1976) for trickle irrigation of tobacco seedbeds using Viaflo porous plastic tubes, with a 2-in. diameter well and 22 beds, 295 x 13 ft. each.

Based on 10 sprinkler irrigations per season and a man-hour cost of \$2.50, the recurring cost of the Viaflo tube and filters would be compensated by the labor saving. Savings resulting from smaller energy consumption, greater fertilizer and insecticide efficiencies, and better quality seedlings would represent net profits to the farmer.

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Trade names are used for identification purposes only and do not imply preference of this item.



Gasoline engine, pump, filter and pressure gauges used to supply water to a trickle-irrigation system.

Tobacco seedling measurements from two irrigation methods [1975].

	Sprinkler-Irrigated	Trickle-Irrigated
Plant height (cm)	12.7	14.6
Dry weight (g)	0.3	0.5
Number of leaves/plant	5.1	5.9
Leaf area (cm ²)	77.7	107.2
Seedling density (plants/ft ²)	47.3	59.6
(plants/929 cm ²)		